SCIENCE

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FRIDAY, JUNE 2, 1899.

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THE INTERNATIONAL CATALOGUE OF SCIENTIFIC LITERATURE.—SECOND CONFERENCE.

I.

IN SCIENCE for August 6, 1897 I gave an account of the steps which led to the holding of the first Conference on an International Conference of Scientific Literature, and a somewhat detailed description of the Proceedings of the Conference.* At the invitation of the editor of SCIENCE, I shall describe below the work done since that time to reach a working plan for this most important undertaking.

The first Conference, in July, 1896, had reached certain definite conclusions, which may be briefly stated as follows: (*a*) That it was desirable to publish a catalogue of scientific literature by means of some international organization; (*b*) that the catalogue was to be primarily for the scientific investigator; (*c*) that papers were to be indexed according to subject-matter; (*d*) that the catalogue should comprise all published original contributions to science; (*e*) that the catalogue be issued in the double form of slips and books.

The Conference passed a resolution to the effect "that the Royal Society be requested to form a committee to study all questions relating to the Catalogue referred to it by the Conference, or remaining undecided at the close of the present sittings of the Confer-

* The article was also published in separate form.

ence, and report thereon to the governments concerned." It was also left to the Committee "to suggest such details as will render the Catalogue of the greatest possible use to those unfamiliar with English."

In accordance with the terms of these resolutions, the Royal Society appointed, in November, 1896, a Committee, with Professor Henry E. Armstrong as Chairman, which presented a report on March 30, 1898. This report consisted of a series of proposed regulations for the conduct of the Catalogue, a provisional financial statement, and schedules of the various sciences. Inasmuch as this report formed, in a large measure, the basis of the discussion and resolutions of the second Conference, it seems desirable to present an outline of its contents.

Schedules of Classification. Authorized schedules are to be prepared for the several branches of science included in the Catalogue; each of these to be indicated by a Roman capital letter known as the Registration letter; the division in each schedule to be indicated by numerical symbols called Registration numbers; when desirable, an alphabetical index of the several headings be appended to each schedule.

Card Catalogue. For each communication to be indexed at least one slip called Primary slip shall be prepared containing title entry, subject entry, registration symbols and significant words. These slips are to be prepared by the bureaus established in the various countries (regional bureaus), which will transmit them to the Central Bureau as rapidly as possible. When a primary slip bears more than one subject entry or registration number copies of secondary slips shall be prepared. Slips of standard size, stoutness and color are to be printed for issue to subscribers, each slip to be revised by an expert official of the Central Bureau.

Book Catalogue. At determined regular intervals the Central Bureau shall issue, in book form, an author's and subject index of the literature published within that period. This Book Catalogue shall be obtainable in parts corresponding to the several sciences or in divisions of such parts. After the first issue of the Book Catalogue the Committee of Referees are to be consulted as to the desirability of making changes in the classification.

International Council. This shall be constituted by one representative of each Regional Bureau and shall be the governing body of the Catalogue. It shall appoint its own Chairman and Secretary, and shall meet in London at least once in three years; this Council is to be the supreme authority for all matters belonging to the Central Bureau, and is to report its doings to the Regional Bureaus.

International Committee of Referees. The International Council shall appoint, for each science included in the Catalogue, five persons skilled in that science to form an International Committee of Referees. The members shall be appointed in such a way that one retires each year. These committees shall be consulted by the Director of the Central Bureau on all questions of classification not provided for by the regulations.

The Central Bureau is to be composed of a paid staff, consisting of (1) a General Director, (2) for each branch of science a skilled assistant, (3) clerks. There is also to be a Consultation Committee, consisting of persons representing the several sciences and residing in or near London.

The next portion of the report is explanatory of the schedules of classification. It is expressly stated that the schedules are put forward as illustrations of feasible methods of classifying the several sciences and not as final or authoritative. A detailed account of the method of the work of the Central Bureau is given, which need not be entered upon here.

Financial Statement. It is estimated that about 40,000 communications will have to be analyzed and indexed per annum. If there are on an average 3 analytical slips for each entry this would make 160,000 slips per annum, or about 530 for each working day. It is further estimated that the Book Catalogue will amount to 16 volumes per annum.

Book Catalogue. The estimated cost of the Book Catalogue (counting an edition of 500 copies) is £5,450, which would be covered by a subscription to 350 sets at £1 per volume.

Slips or Card Catalogue. If but a single or primary slip is considered the additional expense would be £3,076, and allowing £1,000 saving on printing the book it would require 130 complete subscriptions at £16 to cover this expense. If the full, or analytical-slip, catalogue be prepared 120,000 additional slips would have to be dealt with per annum and 171 institutions would have to pay £35 to cover the cost, which would, however, slightly reduce the cost of the primary slips. It would, of course, be provided that portions of the catalogue could be subscribed for separately. The following table furnishes a clear idea of the expenses and charges:

	Total cost.	Least remunerative number of complete subscriptions.	Average subscription to single science.	Maximum subscription to single science.	Complete subscription.
Book Catalogue (1,000 copies)	£5,590	£350	£1 0 0	£2 0 0	£16
Primary Slip Catalogue (200 copies)	3,075	130	1 0 0	1 17 6	15
Secondary Slip Catalogue (200 copies)	5,992	171	2 5 0	4 7 6	35
	£14,657	—	£4 5 0	£8 5 0	£66
Less saving on use of Linotype	1,000				
	£13,657				

The Committee expressed the opinion that if the Book Catalogue alone were published the subscription might be expected to cover the expenditure, whereas if the Slip Catalogue were published as well the expenditure would probably be beyond the sum which can reasonably be expected to be raised.

In view of this conclusion the Committee raises the question as to whether a primary slip might not be sufficent, whether a monthly bulletin in book form would serve the purpose, or, should the entire Slip Catalogue be desired, whether a 'sustenation' fund could be raised to meet the difficulty. The need of a guarantee fund amounting to about £6,000 is also pointed out.

The remainder of the report is taken up with the schedules, which cannot be discussed here. Anticipating somewhat before coming to the Conference, it may be well to mention that in November, 1898, the Committee issued a memorandum on the systems of classification and registration proposed. It is explained that the minute subdivision was adopted because if the cards accumulated several years the number under each head might grow so large as to make it a work of great labor to search through them. Should the Card Catalogue be abandoned the number of divisions might be considerably reduced in the annual volumes, though it would be desirable to retain them in the volumes ranging over decimal periods, if such were published.

System of Registration. — Each principal

science is indicated by a letter. The divisions of each science are numbered. These divisions can be subdivided by the use of significant words or symbols.

This plan is explained in detail and defended. As a further evidence that the Committee did not consider its schedules final it has issued a revised schedule of Physiology (Animal).

THE CONFERENCE.

The second Conference, which, like the first, was summoned by the British government, was attended by the following delegates, many of whom had participated in the first Conference:

Austria. Professor L. Boltzmann (Kaiserliche Akademie der Wissenschaften, Vienna).
Professor E. Weiss (Kaiserliche Akademie der Wissenschaften, Vienna).

Belgium. Chevalier Descamps (Membre de l'Acad. Royale de Belgique, Président de l'Office International de Bibliographe, Brussels).
M. Paul Otlet (Secrétaire-General de l'Office International de Bibliographie, Brussels).
M. H. La Fontaine (Directeur de l'Office International de Bibliographie, Brussels).

France. Professor G. Darboux (Membre de l'Institut de France).
Dr. J. Deniker (Bibliothécaire du Muséum d'Histoire Naturelle).
Professor E. Mascart (Membre de l'Institut de France).

Germany. Professor Dr. Klein (Geheimer Regierungs-Rath, University of Göttingen).

Hungary. Dr. August Heller (Librarian, Ungarische Akademie, Buda-Pesth).
Dr. Theodore Duka (Member of the Hungarian Academy of Sciences).

Japan. Professor Einosuke Yamaguchi (Imperial University of Kioto).

Mexico. Señor Don Francisco del Paso y Troncoso.

Netherlands. Professor D. J. Korteweg (Universiteit, Amsterdam).

Norway. Dr. Jörgen Brunchorst (Secretary, Bergenske Museum).

Sweden. Dr. E. W. Dahlgren (Librarian, Köngl. Svenska Vetenskaps Akademie, Stockholm).

Switzerland. Dr. Jean Henry Graf (President, Commission de la Bibliothèque Nationale Suisse.)
Dr. Jean Bernoulli (Librarian, Commission de la Bibliothèque Nationale Suisse).

United Kingdom. Representing the Government:
The Right Hon. Sir John E. Gorst, Q. C., M. P., F. R. S. (Vice-President of the Committee of Council on Education).
Representing the Royal Society of London:
Professor Michael Foster, Sec. R. S.
Professor Arthur W. Rücker, Sec. R. S.
Professor H. E. Armstrong, F. R. S.
Sir J. Norman Lockyer, K. C. B., F. R. S.
Dr. Ludwig Mond, F. R. S.

United States. Dr. Cyrus Adler (Librarian, Smithsonian Institution, Washington).

Cape Colony. Roland Trimen, Esq., F. R. S.

India. Lieut.-General Sir R. Strachey, G. C. S. I., F. R. S.
Dr. W. T. Blanford, F. R. S.

Natal. Sir Walter Peace, K. C. M. G. (Agent-General for Natal).

New Zealand. The Hon. W. P. Reaves (Agent-General for New Zealand).

Queensland. The Hon. Sir Horace Tozer, K. C. M. G. (Agent-General for Queensland).

The Conference met Tuesday, October 11, 1898, in the rooms of the Society of Antiquaries (Burlington House) the rooms of the Royal Society not being available, as they were undergoing repairs. Sir John Gorst, President of the previous Conference took the chair, and on motion of Professor Darboux (France) was elected President. Professor Korteweg (Netherlands) was elected Secretary for the German language, M. La Fontaine (Belgium) for French, and Professor Armstrong for English. Three short-hand reporters, one for each language, assisted the Secretaries.

Professor Michael Foster then stated that invitations to the Conference had been issued through the Foreign Office, and gave a list of the acceptances.* The Greek government regreted that they were unable to appoint delegates;† the Russian government did 'not consider it necessary to be represented by a special delegate.' The Danish government took the same view,

* List is given above.

† The Russian government has since requested the appointment of a representative on the International Committee.

being satisfied that it could follow the matter from the verbatim reports issued. The German government, on October 4th, requested a postponement owing to the difficulty of appointing delegates, but it was not possible to arrange for this. Professor Klein, of Göttingen, representing Germany, arrived the second day of the Conference.

The time of meeting was then arranged and a resolution agreed to 'That each delegate shall have a vote in deciding all questions brought before the Conference,' it being understood that the decisions of the Conference did not bind the respective governments. It was further agreed that English, German and French be the official languages of the Conference, but that any delegate might employ any other language, provided he supply a written translation into one of the official languages.

Professor Foster then formally laid before the Conference, on behalf of the Royal Society, the report summarized above, and Professor Rücker, in explaining the report, gave it as his opinion that the secondary cards entailed too great an expenditure and should be given up. Dr. Deniker (France) thought the question to be discussed was whether it was better to publish the Catalogue in the form of volumes or cards.

Professor Darboux was opposed to giving up cards which rendered great service to scholars. He thought it best to discuss the scientific questions first and leave this matter to the body which would be charged with the actual workings of the Catalogue.

M. Otlet (Belgium) considered that the order of subjects was threefold: (1) scientific, (2) technical—relative to the method of employing the cards, and (3) financial.

Dr. Graf (Switzerland) dissented, holding that the matter should be taken up in the order indicated by the Royal Society, inasmuch as the financial questions depended upon whether the Catalogue should be issued in both book and card form. He added that his government had given him instructions to advocate the double form.

Dr. Heller (Hungary) also expressed himself in favor of the double form. Dr. Brunchorst (Norway) agreed in principle, but thought at the beginning the Catalogue could only be issued in book form. Professor Boltzmann (Austria) thought that for the present only the book form and primary slips were feasible.

Professor Darboux pointed out that it was at least necessary for the various Bureaus to prepare the Catalogue in slip form and send it to London. The financial question was: Could this Card Catalogue be published? If it could it would be done; if not it could be consulted in London.

Dr. Adler pointed out that if the complete Card Catalogue were published the subscription fee would by no means cover the entire cost to a library; an additional sum for furniture to provide for it, as well as for the arrangement and care would have to be taken into account, as well as the space required, making the total cost of the whole Catalogue and its maintenance to each institution subscribing about £200 per annum.

Dr. Deniker thought the statement as to the space, cost, etc., exaggerated, and formulated the proposition: "The Conference decides in principle for the publication of the Catalogue in the double form of volumes and cards;" after further discussion this resolution was agreed to.

The report of the Committee of the Royal Society was then taken up *seriatim* and it was agreed after a brief discussion as to the form 'That schedules of classification shall be authorized for the several branches of science which it is decided to include in the Catalogue.'

Professor Foster then moved that "Each of the sciences for which a separate schedule of classification is provided be indicated by a Roman capital letter (hereafter called

a registration letter) as a registration symbol, namely, as follows:

A. Mathematics.
B. Astronomy.
C. Meteorology.
D. Physics.
E. Crystallography.
F. Chemistry.
G. Mineralogy.
H. Geology (including Petrology).
J. Geography.
K. Paleontology.
L. Zoology (including Anatomy).
M. Botany.
N. Physiology (including Pharmacology and Experimental Pathology).
O. Bacteriology.
P. Psychology.
Q. Anthropology."

Dr. Bernoulli (Switzerland) pointed out that the plan of dividing the Natural History sciences into several groups was a departure from systems already in existence.

Dr. Heller (Hungary) did not entirely agree as to the wisdom of the division; he pointed out that in the course of years certain institutions and publications had grown up which treated several of the subjects named. Under this plan the publications would be entirely separated. If, however, this was necessary he would advocate a still further division and suggested the separation of Anatomy from Zoology.

Professor Weiss (Austria) suggested that the question be divided, first, as to whether registration letters be used, and second, how the several sciences should be arranged among them. This being agreed to, the original proposition was withdrawn.

Professor Darboux pointed out that in the list of sciences Geography was given, whereas it was his understanding that the first Conference intended to include only mathematical and physical geography.

Professor Weiss indicated the difficulty in agreeing upon an absolutely definite list, due partly to the different development some of the sciences had taken in England and on the Continent. The specialists of the Vienna Academy had suggested that human anatomy should be separated from zoology. No doubt similar suggestions would come from other countries on special points. He, therefore, advised that a small commission be formed by the Royal Society which might consult various specialists and secure a coordinated scheme.

Dr. Deniker thought too much stress was being laid on the matter. It was his opinion that if Pharmacology were to be introduced it should be as a separate science, with a special letter, pointing out at the same time that it was an applied science and not in accordance with the original program, which was to include only pure science.

M. Otlet propounded several questions in the hope of eliciting information as to how the work of the Committee had been done, and M. Darboux pointed out that the science of Mechanics was put down as a section of Physics. He considered Mechanics a fundamental science and thought it should have an independent section.

Professor Armstrong stated in reply that practical considerations had come into play. For each separate science a separate series of boxes would have to be kept, and they provided as many letters as they thought separate boxes would be required. The separate letters were prepared purely for office purposes. The scheme of Geography was, he admitted, purely from the English point of view. The Committee had no communication with foreign academies, but consulted individuals. It desired, however, that foreign individuals and academies should have the opportunity of examining the schedules. Professor Michael Foster stated that the sub-committee which drew up the schedule for Physiology put itself in communication with distinguished and practiced physiologists in other lands, and

that they were now attempting to put the schedule into practical use. He added for the whole Committee that they did not maintain the schedules in their entirety.

Professor Armstrong pointed out that the introduction of a special science like Mechanics was contemplated and was entirely possible under the scheme. He quoted the following from the report: "It will be necessary to provide a separate volume, to be sold apart, for each science to be distinguished by a registration letter; and in some sciences, Zoology in particular, there will, doubtless, be a demand for separate volumes dealing with special sections of a science." "The extent to which the subdivision of the Book Catalogue into parts is carried will necessarily depend on the demand arising in practice."

Mr. Otlet thought that the matter had been somewhat cleared up and favored the subdivision referred to. Anthropology, he said, comprehended nearly all the sciences not included in the other sciences—such as theology, anthropometry, questions relative to the various human races, their industrial occupations, etc.—the concomitant subjects would be nourishment, and hence agriculture, costume, hunting, navigation, etc. Under communication of ideas grammar and the sciences connected with it would come in history, religion, superstition, sociology, slavery, social organizations, all of which would have to be considered.

M. Korteweg said that the subdivision of sciences would also create great difficulties; he favored the exclusion of Political Geography. Professor Darboux said that he was in practical accord with what had been said, but still thought that Mechanics should form a separate class. Dr. Graf desired that Anatomy be separated from Zoology and be placed in a separate class. Dr. Boltzmann suggested that the first class be General Science. Meteorology, he thought, should be connected with Physical Geography. Chemistry should stand between Crystallography and Mineralogy. Anatomy should be in a separate class. The questions raised concerning Mechanics and Anthropology were of great importance, but he thought that the Conference was not ripe for their solution.

Professor Armstrong said that the question raised about Mechanics was a practical one, whereas the definition of the limits of Geography and Anthropology was a scientific matter, and suggested that the latter be dealt with first.

Dr. Heller suggested, instead of the term Geography, that of Geo-Physics; this would include physical geography and meteorology and exclude political geography. He thought, too, that experimental psychology might be included under Anthropology.

Professor Armstrong, to bring the discussion to a conclusion, moved that Geography be limited to mathematical and physical geography, to the exclusion of political and general geography. In doing so he pointed out, however, that this action might lead to the Geographical Catalogue, being of no use to the general geographical student and not being subscribed for.

Dr. Adler stated that travels were of great importance to naturalists and anthropologists and had been included in the Bibliography published by the German Geographical Society. Dr. Duka also favored their retention, but Dr. Mond dissented, holding that this view deviated from the original intention of the Catalogue. The motion to limit the scope of Geography as above stated finally prevailed.

After a brief discussion by Professors Armstrong, Boltzmann, Darboux and Deniker, a resolution was adopted that after Zoology, Anatomy be entered on the list as a separate subject.

The following resolution was then unanimously agreed to:

"It is proposed that a separate schedule be provided for each of the following branches of science: Mathematics, Astronomy, Meteorology, Physics, Crystallography, Chemistry, Mineralogy, Geology (including Petrology), Geography (Mathematical and Physical, excluding Political and General) Paleontology, Anatomy, Zoology Botany, Physiology (including Pharmacology and Experimental Pathology), Bacteriology, Psychology and Anthropology."

The next question taken up was that of the Registration Symbols. Professor Darboux objected to voting on a resolution naming specifically the letters for each science. He thought that it was a detail of execution and would change the character of the Conference if matters of such secondary importance were discussed.

Professor Armstrong, in accordance with this suggestion, presented a motion as follows: "That each of the sciences, for which a separate schedule of classification is provided, shall be indicated by a symbol." Professor Korteweg thought that the question involved that of many different systems of classifications and various schemes of symbols, but Professor Armstrong pointed out, in reply, that if the resolution passed it would not bind the bureau to any particular symbols. M. Deniker thought that the question did not have the importance attributed to it—that the symbols were simply a practical scheme for securing order in the publication and handling of the cards. M. Otlet was inclined to lay more stress on the question; he thought they were not simply a matter for the convenience of the clerks, but would become useful to librarians and scientific men. The resolution was then adopted.

The next question taken up was the regulations concerning the preparation of the cards or slips. These regulations refer not to the Catalogue itself so much as to the preparation of the Catalogue. Professor Foster moved that, "For each communication to be indexed, at least one slip, to be called a 'Primary slip,' shall be prepared, on which shall be either printed, or typewritten, or legibly hand-written in Roman script: Title entries, the author's name, and the full title of the communication in the original language alone if the language be either English or French, German or Latin." In the case of other languages the title shall be translated into English, or such other of the above four languages as may be determined by the Regional Bureau concerned; but in such case the original title shall be added when the language is one which can be conveniently printed. Professor Foster presented this with an amendment to the effect that Italian should be added to the languages named.

Dr. Brunchorst thought it best to have but three languages and omit Latin and Italian, holding that there were very few publications in Latin and that its introduction was not important. He further made the interesting statement that within a few years the Latin language will have disappeared from use in Norway, and that there would probably be no public school in Norway in which Latin could be studied. Professor Rücker stated that, although the title of a paper might be given in Latin, it did not follow that the subject-entry should be in that language. Professor Foster added that Latin was introduced chiefly in the interest of zoologists. Mr. Triman, delegate from Cape Colony, thought it important to retain it. Dr. Adler held that every title should be given in the language in which the paper is written, without any exception whatsoever. Professors Foster and Armstrong both pointed out that some translation of titles was necessary, but Dr. Adler stated that, while translations of titles might be given when necessary, the original title should also be given, either in the original character or in a transliteration. It was agreed to omit Italian but retain Latin, and the first part of the resolution was then carried.

The next proposition under discussion was as follows: "In the case of other languages the title shall be translated into English, or such other of the above five languages as may be determined by the Regional Bureau concerned, but in such case the original title shall be added when the language is one which can be conveniently printed."

Dr. Adler suggested that instead of the last phrase the resolution shall read: "In such cases the original title shall be added; if convenient it shall be printed in the original script, otherwise in Roman script." Professor Foster inquired of the Japanese delegate whether the Japanese language could be conveniently written in Roman script and whether educated Japanese could read transliterations of Japanese, and received an affirmative reply. The amendment was then unanimously agreed to.

The question arose in connection with this matter as to the meaning of the term 'regional bureau,' and Professor Rücker explained that it had been decided to employ this term instead of the word 'National' because it might happen that one nation, as, for instance, the British Empire, may have more than one bureau, whereas some of the smaller countries, like Holland and Belgium, might unite in a single bureau. If there was any objection, he said, to 'regional,' the term 'Collecting Bureau' might be employed.

M. Otlet desired to add to the resolution the phrase 'to diminish the number of necessary translations,' which he pointed out as being extremely desirable, but the President thought this question might be more conveniently raised at a later stage. The entire resolution as amended was then carried.

Professor Foster then moved that "the title shall be followed by every necessary reference, including the year of publication, and such other symbols as may be determined."

The next resolution was "Subject-entries, indicating, as briefly as possible, the particular subjects to which the communication refers. Every effort shall be made to restrict the number of these subject-entries. Such subject-entries shall be given only in the original language of the communication if this be one of the five previously referred to, but in other cases in English, or in such other language as has been used in translating the title."

M. LaFontaine pointed out what seemed to him certain inconsistencies in subject-entries presented in the schedules, and thought that the idea of the subject-entries was not fully understood, but both Professors Foster and Armstrong combatted this idea. Dr. Adler pointed out the difficulty of grouping the subject-entries satisfactorily in view of the fact that the analysis could be made in five languages, but Professor Rücker explained that the alphabetical arrangement would be according to English words.

Chevalier Descamps stated that the book issue would require the repetition of titles, and that on the whole it would be more economical to repeat them entire. To this suggestion Professor Armstrong agreed, pointing out that its necessity had been recognized by the Committee.

M. Deniker inquired as to the relative value of the terms subject-entry and catch-word. Was the subject-entry to be subordinated to the significant word, or *vice versa*? Professor Foster explained that the subject-entry was to give an idea what the paper was about, the symbols to aid in keeping the Card Catalogue in order, and the significant words to aid the student who did not carry the symbol in his mind.

M. Deniker replied that it was now clear to him that what was proposed was not simply a catalogue, but an analysis. What limits he asked, would be imposed. Thus four or five subject-entries might be given

in describing a single memoir. While recognizing the usefulness of these, he thought some limit would have to be considered.

Professor Foster replied that for three years past the Royal Society had requested each author to give an analysis of his paper in such form that it might serve as a subject-index, and that in a large majority of cases it had been found possible to limit the analysis to three subject-entries.

Professor Rücker pointed out that significant words would serve as a sort of temporary expedient where a sudden interest sprang up in some new discovery, instancing the Röntgen rays. After some further discussion the resolution as to subject-entries was carried unanimously (the Belgian delegates abstaining from voting).

Professor Armstrong then moved that "registration symbols, in accordance with those in the schedules of classification, shall be entered upon the slips in some conspicuous manner, and upon a uniform plan." He explained that at the first Conference schedules in accordance with the decimal system had been prepared and submitted, and that the Conference had decided against them. The plan now proposed is distinctly not the Dewey system. The figures given have no absolute value, and are solely for the purpose of enabling librarians to sort the cards and arrange the material.

This point was emphasized by Professor Rücker, who stated that in a system in which the numbers had an absolute value the method was equivalent to starting a new language, and he did not believe that the average scientific man would learn a language for such a purpose.

Chevalier Descamps addressed himself to the question of classification. He recognized the serious attention which had been given to the subject by the Royal Society, but said that the Society was not the first to take up the study which had been pursued by a large number of authors, men of science and practical men. To provoke a general debate on classification seemed inopportune. He had pointed out in 1896 the possibility of a bibliographical classification based on the decimal system. This did not meet with favor, and the Royal Society had endeavored to produce a purely scientific classification. For its labors it merited the most profound recognition, but he regretted that the Royal Society had not explained the ideas which underlay its schedules. To be good a bibliographical classification should be both stable and elastic. The adoption of a mixed system of symbols, and more especially the lack of identity of meaning of the same symbols in the different sciences, seemed regrettable. He saw no objection to giving symbols a definite significance.

The statement of Chevalier Descamps (of which the above is but a brief abstract) brought from Professsor Rücker an argument which probably expressed the opinion of most of the scientific men present, and is accordingly given in full:

"I think it would be desirable if I say a few words with regard to the very interesting remarks with which Chevalier Descamps has favored us. I think we must all agree that the questions he has raised are questions of the greatest interest to any one who has attempted to take any share in a work of this sort. But I very much regret, speaking for myself, that I find myself at variance with him on several fundamental points. In the first place, he urges us to adopt the scientific system of classification, which shall not change from five years to five years, or ten years to ten years, but which shall hold good for all time, or for a very long period of time. One of the very great advantages of our system is that we recognize that science is a growing subject. The notation that fits it to-day will not fit it next year, or ten years hence. Let us

suppose scientific knowledge had sooner led us to recognize the close relation of electricity and light. Surely the mode of division would be quite different. The definition of Zoology before and after Darwin would have been different. A classification which then appeared to be scientific would now be recognized as inadequate. The very first thing we must recognize is that our scientific knowledge is imperfect and growing, and we must adopt a system capable of easy modification as our knowledge increases. Another point which Chevalier Descamps made was that we adopt different methods with regard to different sciences; in some cases the numbers are followed by symbols; in some cases the numbers are separated by a hyphen, and so on. We have gone into this question as scientific men, and, although perfectly ready to submit the result of our work to the criticism of other scientific men, we do believe that the plan that suits best one science will not suit another. Take one example. Take, for instance, Zoology. There is the question of arrangement of the subject in accordance with the species of animals, and the question of arrangement with regard to the geographical distribution. Here are two ideas to which there is nothing similar in physics or chemistry. It would be disastrous if we attempt to force all these sciences to adopt the same method. If two things are essentially different, we do not apply the same principles to both. In the last place, Chevalier Descamps says the main object of classification is to tell us where to find a particular object with which we are dealing. I do not much believe in the average memory of scientific men being able to grasp a large number of numbers. I believe it is much easier to find the place by using symbols, which are more distinct than a large number is from a small one. Significant words which are for temporary use have their own meaning. You find them alphabetically. I do think, on the question of general principle, that it is very desirable that the Conference should express an opinion as to whether or not they think the symbols are to be devised in such a way as to help the memory or to find the place; secondly, whether they do or do not hold the view that the plan good for one science is good for all, and whether it is desirable to attempt to plan a scheme in the belief that it will hold good for all time."

Dr. Bernoulli said that after hearing the statements in favor of the two systems he wished to add that the decimal system was in actual working order in Switzerland, and that its practical utility had been demonstrated there. He considered it superior to the system proposed by the Royal Society, although originally he had been an opponent of the decimal system.

M. Deniker replied that it was necessary to consult an alphabetic index to use the decimal-system catalogue. He favored a methodical or subject catalogue alphabetically arranged.

CYRUS ADLER.
SMITHSONIAN INSTITUTION.

(To be Concluded.)

COLOR-WEAKNESS AND COLOR-BLINDNESS.

IT is generally accepted as a well established fact that the traveling public is fully protected by the present tests for color-blindness to which railway employees and pilots are subjected. Yet several of the mysterious accidents that have occurred during the last two years might be explained on the supposition of color-blindness on the part of responsible lookouts. In fact, I believe myself in position to prove that persons of dangerously defective color-vision actually do pass the regular tests and obtain positions where their defects are continual dangers to public welfare.

In the first place, I have at the present time among my students one who is abso-

lutely perfect at the wool-test. He can match wools with incredible precision at any distance away; he is, nevertheless, color-blind. This case is typical of a class of persons with eyes abnormally acute for differences in color, but yet with only two fundamental sensations instead of three.

In the second place, I have had among my students those who possessed perfect color-vision for near objects or bright objects, but who were practically color-blind for weakly illuminated or distant objects. These persons possess the typical three fundamental color sensations, but have one of them weaker than the normal. A person of this kind may pass the wool-test with the utmost perfection if the test is performed close by, but will fail if the wools are removed to a distance of 20 or 30 feet. This peculiar defect I take the liberty of terming 'color-weakness.' The first student of this kind that I examined passed the wool-test close at hand and yet was unable to distinguish red and green lanterns a few hundred yards away. Cases similar to this have been reported by the British Marine Examiner, Edridge-Green. Among other cases he quotes a letter from an engineer containing the following statement: "I have been on the railway for thirty years and I can tell you the card-tests and wool-tests are not a bit of good. Why, sir, I had a mate that passed them all, but we had to pitch into another train over it. He couldn't tell a red from a green light at night in a bit of a fog."

To eliminate both these classes of persons we must have a method of testing on quite different principles from the usual ones.

In the first place, the sorting of delicate shades of colors, according to likeness, must be replaced by *naming certain fundamental and familiar colors.* The sorting of wools is a quite unusual and perplexing task to a man brought up in a railway yard and on shipboard. It puts a nervous man at quite a disadvantage; it furnishes the unsuccessful candidate with the excuse that the judgment required was so unlike any he had made before that he failed from nervousness; and, finally, it is not a guarantee that all who pass are not color-blind. The naming of colors should—as Donders proposed—be rigidly required. The engineer or the pilot in his daily routine is not called upon to match colors, but to decide whether a light is red, green or white; he should be tested on just this point. The color-blind student referred to above who can pass the wool-test to perfection fails at once when called upon to name the wools. The naming of delicate and perhaps unusual shades should, however, not be required; the colors to be named should be the three familiar ones: red, green and white, so manipulated that every possible chance for confusion is presented.

The second necessity for eliminating danger is that of an absolutely certain test which shall detect both the color-blind and the color-weak. Acting on the basis of suggestions from the work of Donders and of Edridge-Green, I have devised a test that meets this requirement as well as the first one.

The instrument* which I have invented may be termed the 'color sight tester' or the 'color sense tester.' In general appearance it resembles an ophthalmoscope. On the side toward the person tested, Fig. 1, there are three windows of glass, numbered 1, 2 and 3, respectively. The opposite side of the tester, Fig. 2, consists of a movable disk carrying twelve glasses of different colors. As this disk is turned by the finger of the operator the various colors appear behind the three windows. At each movement of the disk the subject calls off the colors seen

* For those interested in obtaining the Color-Sight Tester I will say that I have made arrangements to have it made by the Chicago Laboratory Supply and Scale Co., Chicago.

at the windows. The windows, 1, 2 and 3, are, however, fitted with gray glasses. No. 1 carries a very dark smoked glass; all colors seen through it will be dark. No. 2 carries a piece of ground glass, showing all colors in full brightness. No. 3 carries a light smoked glass. There are thus thirty-six possible combinations of the colors. The twelve glasses are, however, mainly reds, greens and grays.

A suitable arrangement of the colors reds, greens and grays simultaneously in a large number of different shades of intensity. The light of a green lantern, at different distances or in a fog, is simulated by the green behind the different grays; at the same time a white light is also changed. The color-weak person to whom weak green is the same as gray (white at a distance) is utterly confused and thinks that the weakened green is gray (white) and the dark gray is green.

FIG. 1.

FIG. 2.

gives direct simultaneous comparisons of reds, greens and grays of different shades. The well-known confusion by color-blind persons of dark greens with reds, greens with gray, etc., are exactly imitated, and the instrument gives a decisive test for color-blindness. Its peculiar advantage, however, lies in the fact that it presents

The actual test is performed in the following manner. The tester is held toward a window, at about 2½ feet from the person tested. The operator begins with any chance position of the glasses, and asks the person tested to tell the colors seen through the three glasses, Nos. 1, 2 and 3. He answers, for example: "No. 1 is dark red; No.

2 is gray; No. 3 is green." The operator records from the back of the tester the letters indicating what glasses were actually used. If he finds that A, D and G were opposite the glasses Nos. 1, 2 and 3 he records: A 1, dark red; D 2, gray; G 3, green. The disk is then turned to some other position; the colors are again named, and the operator records the names used. For example, the result might be: "No. 1 is dark green; No. 2 is white; No. 3 is red;" and the record would read: G 1, dark green; J 2, white; A 3, red. Still another record might give: J 1, dark gray; A 2, red; D 3, medium gray. Similar records are made for all combinations. Of course, the person tested knows nothing concerning the records made. A comparison with a list of the true colors for each position determines whether the test has been passed or not.

The three records just cited were all obtained from the red glass, A; the gray glass, D; the green glass, G, and the ground glass, J, in combination with the dark gray, No. 1; the ground glass, No. 2, and the medium gray, No. 3. Those familiar with color-blindness will notice that these combinations place side by side the colors most confused.

The records can be taken by any one, and, on the supposition that the record has been honestly obtained and that the instrument has not been tampered with after leaving the central office, the comparison is mechanical. There is none of the skillful manipulation required in the wool-test and none of the uncertainty attaching to its results. The only instruction given to the subject is: "Name the colors;" the results render the decision with mechanical certainty.

One of the testers is in use on one of the English railways, another on the central division of the New York Central Railroad. From the former I have not yet heard, but the examiner on the latter reports that since using the tester he has found men who get through the wool-test, but are caught by the tester. On the other hand, he states that "the men examined say that this test is more like the signals they are used to seeing every day on the road, and is, therefore, fairer than to ask them to pick out a lot of delicately tinted pieces of yarn."

An experience of several years seems to justify the following claims for the color-sense tester:

1. It detects with unerring precision both the color-blind and the color-weak.

2. It is a perfectly fair test for the men concerned and injures no man by requiring an unfamiliar judgment.

3. It requires but a very small fraction of the time used on the wool-test.

4. Its decisions are self-evident and unquestionable.

E. W. Scripture.

Psychological Laboratory,
Yale University,
May 7, 1899.

AMERICAN CLIMATOLOGICAL ASSOCIATION.

The sixteenth annual meeting of the American Climatological Association was held in New York City on May 9th and 10th at the hall of the New York Academy of Medicine. About fifty members were in attendance from all portions of the United States. Twenty-five papers were read upon subjects pertaining to climatology, hydrology and diseases of the respiratory and circulatory organs. These papers, which will appear in the annual volume of the Transactions, were as follows:

'Presidential Address,' by Dr. Beverley Robinson, of New York.

'Treatment of Consumption by Air and Light in Colorado,' by Dr. Charles F. Gardiner, of Colorado Springs.

'Intermediate Altitude for the Consumptive,' by Dr. B. P. Anderson, of Colorado Springs.

'The Contagiousness of Phthisis Pulmonalis,' by Dr. E. L. Shurly, of Detroit.

'Climate in Relation to Renal Disease,' by Dr. J. B. Walker, of Philadelphia.

'Climate as it affects the Skin and its Diseases,' by Dr. L. D. Bulkley, of New York.

'Hygienics of the Skin,' by Dr. L. D. Judd, of Philadelphia.

'Hydrotheraphy in the Treatment of Insomnia,' by Dr. Irwin H. Hance, of Lakewood.

'Altitude and Heart Disease,' with report of cases, by Dr. R. H. Babcock, of Chicago.

'Prognosis in Chronic Valvular Affections of the Heart,' by N. S. Davis, Jr., of Chicago.

'Treatment of the Cardiac Asthenia of Pneumonia,' by Dr. H. L. Elsner, of Syracuse.

'Empyema from a Surgical Standpoint,' by Dr. Johh C. Munro, of Boston.

'Traumatic Rupture of the Heart, without Penetration of the Chest Wall,' with a case, by Dr. Richard C. Newton, of Montclair.

'Cold Wave of February, 1899,' by Dr. Guy Hinsdale, of Philadelphia.

Other papers by Drs. R. G. Curtin, C. F. McGahan, Harold Williams, F. H. Williams, E. O. Otis and V. Y. Bowditch, S. G. Bonney and H. S. Anders.

The annual dinner of the Association was held at the Manhattan Hotel, at which the President, Dr. Beverley Robinson, of New York, presided. On the following day the Association made a visit to the Loomis Sanitarium in Liberty, Sullivan County, New York. This institution was founded 1895 in memory of Dr. Alfred L. Loomis, the first President of the Association, for the treatment of tuberculosis. It has a favorable situation, 2,300 feet above tide, and is 120 miles from New York, on the Ontario and Western Railway. The remarkable success which has attended its work has been due in great measure to its physician in charge, Dr. J. E. Stubbert, liberally aided by the philanthropic support of Mr. J. Pierpont Morgan and the ladies who are associated in its management.

The scientific work of the Climatological Association tends to the better knowledge of the various American climates and health resorts and their employment in the treatment of disease.

The subject of tuberculosis is now receiving universal attention by the medical profession, and the public are being interested in measures looking to its prevention and restriction. It is encouraging to note that in all our large cities the mortality from this disease is gradually falling, and through societies of this kind knowledge is disseminated which affords the public greater protection and prolongs life. The resources of New York and Pennsylvania for the climatic treatment of pulmonary disease are not so well known as they should be. Neither are the mineral springs of the United States fully understood and intelligently used. The Transactions of the Climatological Association, now numbering fifteen volumes, have contributed in no small degree to the better knowledge of this extensive subject.

The following officers were elected for the ensuing year: President, Dr. A. Jacobi, of New York; Vice-Presidents, Dr. R. H. Babcock, of Chicago, and Dr. John W. Brannan, of New York; Secretary, Dr. Guy Hinsdale, of Philadelphia; Representative to the Executive Committee of the Congress of American Physicians and Surgeons, Dr. F. I. Knight, of Boston.

The next meeting will be held in Washington in May, 1900. GUY HINSDALE,

Secretary.

SCIENTIFIC BOOKS.

SOME SMITHSONIAN PUBLICATIONS.

Annual Report of the Board of Regents of the Smithsonian Institution, showing the operations, expenditures and conditions of the Institution to July, 1896. 8vo, lii + 728 pp., lxi pls. Washington, 1898. [Received by the Bureau of International Exchanges, January 25, 1899.]

Annual Report of the Board of Regents of the Smithsonian Institution, showing the operations, expenditures and conditions of the Institution for the year ending June 30, 1896. Report of the U. S. National Museum. 8vo, xxiv + 1108 pp., cxcviii pls. Washington, 1898. [? 1899.]

Proceedings of the United States National Museum. Volume XX. Published under the direction of the Smithsonian Institution 8vo, xii + 932 pp., xcvii pls. Washington, 1898. [? 1899.]

The activities and influence of the Smithsonian Institution have so extended that, instead of a modest Report of some hundred pages, its annual publishing output comprises several bulky octavo volumes. It is only 15 years since the Report of the United States National Museum was issued in distinct covers from that of the Smithsonian Institution. And now, to judge from the copy submitted for review, even this has reached limits that transcend the binder's art, and suggest that a further division into volumes would be beneficial. The line of division is obvious, for the Reports both of the Smithsonian and of the Museum owe their present thickness chiefly to the articles of general interest which are printed after the annual official statements. The public is, doubtless, grateful for these admirable articles, but its gratitude would be increased were they presented in more convenient form. The numerous readers that will be found for Mr. Thomas Wilson's richly illustrated account of 'Prehistoric Art' will not wish to be weighted with lengthy lists of accessions to the library, of new species described by the Museum staff, or of specimens sent to the Museum for identification. On the other hand, the professional museum-curator, who doubtless keeps the richly suggestive, one might say the classical, reports of the Smithsonian officials at hand for reference, will soon find his available space choked up with reprints of papers that he either has no longing for or already has in their original form.

The present Appendices to the Administrative Reports have, it is true, grown in a natural manner, on the one hand out of the summaries of progress in science that used to be attempted by the Smithsonian, and on the other hand out of short accounts or catalogues of specimens in the National Museum. Moreover, there may be something in the terms of the appropriation by Congress that renders the present mode of publication an official necessity. In such case a strong expression of the value attached at home and abroad to the several sections of these Reports, and of the inconvenience resulting from their union, may do something to facilitate a change.

There is another argument in favor of the proposed separation. The information contained in these reports is as out of date as that in an ordinary science text-book. The world looks for more actuality in news that come from the United States. There is little in this 'Report of the U. S. National Museum for the year ending June 30, 1896' that the intelligent readers of SCIENCE did not know nearly three years since. We all knew that "Under an order issued by the President on May 6, 1896, the National Museum [with the other departments of the Smithsonian Institution] was made subject to the law regulating appointments and promotions in the Civil Service of the United States." We have read all about the government exhibit at the Atlanta Exposition in Brown Goode's contemporaneous report. We have mourned for Professor C. V. Riley and Mr. R. E. Earll, and, alas! for the writer of their obituary notices, here reprinted from SCIENCE. We have heard enough—perhaps too much—about Alaska and the seal fisheries of Bering Sea. There is little left but the statistics previously referred to. And since the letter of transmittal is dated August 8, 1896, why should we have to await these 284 pages for two years and a half? The reason appears to lie in the elaborate papers contained in Part II., which, it is obvious, could not have been published in 1896. Internal evidence shows that Mr. Thomas Wilson's attactive work on Prehistoric Art, of 340 pages, 75 plates and 325 text-figures, was not completed in manuscript before 1897. Mr. Stewart Culin's fascinating account of the origin of chess and playing cards has an introductory note dated August, 1897, and contains quotations from matter printed in that year. The equally interesting account of the exhibit of Biblical Antiquities at the Atlanta Exposition, by Drs. C. Adler and I. M. Casanowicz, contains more than one such reference. It is not likely that Dr. Walter Hough's exhaustive monograph on the lamp of the Eskimo was ready for the printer before the articles that precede it. Why should not all these have been issued separately, or at least reserved for the 1897 Report?

To write any comprehensive review of the extraordinarily diverse matter in the three volumes before us would be impossible for a single individual, however unlimited his time. The papers following the Smithsonian Report are representative of the various branches of science, and the general reader will gain from them a fair idea of what is now being done by scientific workers. Most of them have appeared elsewhere, but English-speakers will be glad to have the translations of Dr. L. Königsberger on 'The Investigations of Hermann von Helmholtz on the Fundamental Principles of Mathematics and Mechanics,' Professor A. Cornu on 'Physical phenomena of the upper regions of the atmosphere,' O. Wiener on 'Color photography by means of body colors, and Mechanical color adaptation in nature,' Dr. Heim on 'The biologic relations between plants and ants,' H. Meyer on 'Bows and arrows in Central Brazil,' and J. de Morgan's 'Account of the work of the service of antiquities of Egypt and of the Egyptian Institute during the years 1892, 1893 and 1894.' As an example of work carried out under the auspices of the Smithsonian Institution, we are presented with Dr. J. Walter Fewkes' 'Preliminary account of an expedition to the Pueblo ruins near Winslow, Arizona, in 1896,' which expedition, it may be noted, accomplished its work some weeks after the annual report was transmitted to Congress. Other communications that appear to be published here for the first time are: 'Was primitive man a modern savage?' by Talcott Williams; 'Memorial of Dr. Joseph M. Toner,' by Ainsworth R. Spofford, and 'William Bower Taylor,' by W. J. Rhees. The rest of the articles are reprints, mainly from the Proceedings of the Royal Institution of Great Britain and from SCIENCE.

The more technical papers based on the collections in the U. S. National Museum are contained in Vol. XX., of the Proceedings of the Museum. In pursuance of the excellent policy pursued by the Institution, these have already been issued in pamphlet form, so as not to delay the publication of important scientific novelties. But it is to be wished that this policy could be carried into effect in a more practical manner. Let us take two examples. The volume opens with an elaborate and (thanks to the Elizabeth Thompson fund) richly illustrated work on the Rocky Mountain locust and its allies, entitled 'Revision of the Orthopteran group Melanopli (Acridiidæ), with special reference to North American forms,' by that eminent entomologist and bibliographer, S. H. Scudder. The work contains numerous new species and new genera. A key to the genera is given, and is said to have been 'issued in advance in the Proceedings of the American Academy;' but from beginning to end no hint is given as to the previous publication of the paper as a whole, and 9 workers out of 10 would be as likely as not to give it the date of the bound volume, which the title-page states to be 1898, but which, one may hazard a guess, was really 1899.* The tenth worker might have received the previously issued separate copy of Mr. Scudder's paper, though it was unknown to the laborious compiler of the section Insecta in the *Zoological Record* for 1897—a somewhat important fact in in this connection; or he might chance to see in the table of contents the affixed date, 'December 28, 1897.' Is this date intended for the date of previous publication? If so, a statement to that effect should have been repeated at the beginning or end of the article itself. Even the previously issued separate copies of these articles do not bear the exact date. The paper wrappers give the year (truthfully, let us hope!), but what we have been led to expect from American systematists is at least the month, if not the day or even the hour of publication, printed on the sheet itself. In the second example that we shall take, matters are more complicated. No. 1132 is 'Preliminary diagnoses of new mammals* * * * from the Mexican border * * *' by Dr. E. A. Mearns. The competition between the describers of species in this class is now so keen that the demand for dates is imperative. The Smithsonian meets the appeal with its wonted generosity. It gives three dates: the date of the bound volume, 1898 [or 1899]; 'Advance sheets, March 5, 1897;' and again, 'January 19, 1898.' What, then, is the date of *Neotoma cumulator*

*At any rate the volume has not yet been received by the British Museum (Natural History), 22 April, 1899.

Mearns? The date of the advance sheets is, in this case, given with the paper itself, and they are described as 'published.' But if so, there can be no meaning in the date 'January 19, 1898.' If, on the other hand, 'January, 19, 1898,' is regarded by the Secretary to the Smithsonian as the date of publication, then the advance sheets must be ruled out of court. What do you mean by 'advance sheets,' anyway? Are they proofs under revision? Are they to be had by the public? Can they substantiate a claim of ten or eleven months' priority? These questions are not rhetorical. We want to know. The ever-green preliminary notice is nuisance enough; but a preliminary notice that ranges vaguely between March, 1897, and February, 1899, ought to be snuffed out by its own absurdity.

To turn from these vexed and vexing questions to the papers themselves—After Dr. Scudder's monograph, which occupies nearly half the volume, the more important are Professor E. Linton's 'Notes on Cestode and Trematode parasites of fishes,' Professor Dean C. Worcester's and Dr. F. S. Bourns' 'Contributions to Philippine Ornithology,' Walter Faxon's 'Observations on the Astacidæ in the U. S. National Museum and in the Museum of Comparative Zoology [Cambridge, Mass.], with descriptions of new species,' Professor C. P. Gillette on 'American leaf-hoppers of the subfamily Typhlocybinæ,' Professor A. E. Verrill's and Miss K. J. Bush's 'Revision of the deep-water Mollusca of the Atlantic coast of North America, with descriptions of new genera and species. Part I., Bivalvia.' From these and the lesser papers in the volume it is clear that the U. S. National Museum plays an effective part in the advancement, no less than in the diffusion, of knowledge; and the high proportion of contributions from others than those on the staff indicates a total absence of that dog-in-the manger quality which often finds a congenial home in establishments of this kind.

Indeed, if there is one character more praiseworthy than another in these records of work done it is the spirit of helpfulness and fraternal cooperation that animates the whole. The concentration of the national collections in one group of buildings, the association of the Museum with an institution of such world-wide scope as the Smithsonian, the proximity of other administrative and scientific departments of the government, all tend to foster this spirit. Nevertheless, its development, as we see from the example of other cities, is not a necessary consequence; it needs cultivation. In Washington its growth is due less to favoring circumstances than to the high character and ideals of the men connected with the Smithsonian Institution, and notably of recent years to the charming personality and unwearying efforts of the late Assistant Secretary. A remarkable instance of this appears in the list of the scientific and administrative staff, which comprises among the Curators or Assistant Curators no less than 28 described as 'Honorary, and serving without salary.' The work done by these unpaid curators is no mere amusement; they take their share in the drudgery of registration, labelling and cleaning. It is true that the majority of them receive pay from the government in other capacities; but this emphasizes the point, for rivalry rather than cooperation between the various departments is the rule in most other countries. The gain, of course, is not wholly on the side of the Museum.

In harmony with these principles of mutual aid, the Museum differs from many national museums in its custom of sending out large quantities of material. Partly this is in connection with local exhibitions, and this branch of the Museum's activity may be compared to that of the Loan Section of the British Science and Art Department. Further, specimens are lent to scientific workers freely and in large quantities. Presumably this applies, not to specimens of historic interest, but to material in the reserve collection. No doubt some damage is done and some specimens may be lost in consequence of these operations. For all that, the Museum is a gainer, on the one hard by the awakening of national interest and the increased number of its correspondents, on the other through the elaboration of its material by specialists in all parts of the world.

Apropos of correspondents, those of the Smithsonian and the Museum are perhaps numerous enough already. Every citizen of the United States seems to be as tenacious of his right to

question the officers on any subject under the sun as he is of his right to shake hands with the President. The list of specimens sent to the Museum for identification during the year fills 24 columns. About 10,000 letters seem to have been received and replied to. The conchologists alone had to identify over 3,000 species and to write over 1,000 pages of correspondence. Defensive measures have become necessary. *Circular* 47, U. S. National Museum, stipulates that the material must be sent free of expense to the Museum, unless otherwise agreed upon, and that the localities from which the specimens were obtained must be given. The Museum reserves the right to retain, except under special arrangement, specimens needed to complete the national collection.

There are many other points in these Reports one would like to discuss did one not feel the information to be a little out of date. Attention may, however, be directed to Dr. J. M. Flint's account of methods for the public exhibition of microscopic objects (Rep. U. S. N. M., pp. 96, 97, pls. i.–iv.). There are two forms of apparatus; in both an ordinary microscope is employed, but in one the objects are fixed on a rotating disc, while in the other ordinary glass slips are attached by brass clips to an endless linen band passing over rollers. "Microscopes copied from the original here described have been in use for several years, and no irremediable difficulties have been found in the way of their perfectly successful operation." An apparatus of this kind has been in use at the Hamburg Natural History Museum for some years; but few, if any, other museums have followed this example. Perhaps Dr. Flint's account may induce them to adopt this method of overcoming the difficulty of exhibiting very minute objects. The foregoing is only one instance of the improvements in museum technique that are constantly being introduced by the energetic officers of the U. S. National Museum. It is the detailed account of such matters that makes the Report of permanent value to other museum-curators, while it evinces the hearty interest taken in their work by all members of the staff.

F. A. BATHER.

NATURAL HISTORY MUSEUM,
LONDON, S. W.

Introductory Logic. By JAMES EDWIN CREIGHTON. The Macmillan Company.

The aims of this book, as indicated in the preface, are three. It is intended for an elementary college text-book; it is founded on a belief in the value of the traditional 'formal' logic, and hence on a desire to conserve, just so far as may be, the forms and exercises of that logic; and the author hopes, before he has done, to have presented likewise a genuinely modern theory of thought. The first purpose, of course, must be kept in mind in judging ultimately both the omissions of the work and all the admissions into it that occur in the way of obvious reflection and simple enlarging comment. The aim of saving the greater body of the old logical teachings, is one which — provided only writer or teacher knows how to breathe again into the material some of the ancient Socratic living practicality and fresh keenness—the majority among instructors of raw classes would still approve of. Their most critical query, therefore, touching this phase of Professor Creighton's work, would be: How far is this endeavor reconciled with the author's third chief aim, that of satisfying also, in his expositions, the requirements of modern scientific truth and orderly completeness? And here, in this attempt of combining and correlating, in a purely elementary treatise, the methods, content and advantages both of the old logic and a newer one, is plainly intended to lie the special feature of our book; as here, indeed, would appear to be afforded, to any writer, his most distinct opportunity for achieving a marked success, if not even his most valid reason for writing at all. For here—it would seem at least—is the largest room for competition with a number of most excellent text-books already outstanding. Thus, on the one side, Minto's Logic is an almost ideally satisfactory beginner's-manual, save in the important circumstance that it hardly more than informs the student of the existence of the modern profounder *theory* of thought; while, on the other hand, a work like —say even Bosanquet's Essentials of Logic, with all its incomplete expression and the tension in its style—presents the broad outlines of the organic view of thought with an admirable philosophic ability, but too far ignores, to ful-

fill entirely the uses of an ordinary introduction, the traditional staple of logic. These simple analyses and operations, as a matter of fact, besides retaining still a certain real point and meaning, would deserve some special consideration if only from the circumstance that, the new branch of induction aside, they are substantially what, in the popular notion and even in the common run of handbooks, will be always confronting the student *as logic, sole and simple.* Professor Creighton commendably would recognize these facts more completely than Dr. Bosanquet has cared to do.

The first two chapters of his book Professor Creighton devotes to an Introduction. The definition of logic, with which he sets out, suffice it to say, is thoroughly modern in spirit. So, too, his differentiation of the function and materials of logic from those of psychology is carried out in a modern, and, moreover, a soundly practical way. In both these connections it would, indeed, have been instructive to have been given some moderately searching review of the effect of different conceptions of the real nature of thought; but this, doubtless, was a topic felt to lie outside the scope of the book. On the venerable theme whether or not logic is an art as well as a science, the author expresses himself thus: The analyses of logic are capable of a practical application, but not to the extent of constituting an art. Thinking is too flexible to enable us, on the basis of our theoretical knowledge, to lay down, as we can in photography or even in medicine, rules for its definite guidance. It is possible to prescribe only the general conditions that must be observed in reasoning correctly.—The question here of our agreement or otherwise will largely be a verbal one as to how an art is to be defined. Professor Creighton himself speaks of the Aristotelian logic, in the ordinary representation, as perhaps more properly described as an art. Still, it may be suspected whether Professor Creighton's general denial of a strict art-character to logic does not hinder him, in his subsequent exposition of the old syllogistic logic (his *exposition*, but *not* the admirable 'exercises' he has appended at the close of the volume), from quite giving due emphasis to those exercises in Socratic 'dialectic' and 'induction,' in interpretation, definition and the like, wherein, rather than in the operation of mere abstract formulas —A's and E's, S's and M's, Baroko's and Bokardo's—lies the best discipline of 'formal' logic. But even more is it to be feared whether the conventional presentation of the old logic, which, as we shall see, Professor Creighton for the most part follows—whether this presentation, either in fulness or in order and method, can meet the requirements of science in the rigorous modern sense, and must not rather seek its sole justification in a paramount simple artistic than a strictly scientific interest and character.

The second chapter of the Introduction is very appropriately a historical sketch. A crying need in the maze of contemporary logical doctrine is a simple but accurate and all-around elucidation for the student—if only for the sake of enabling him to approach the literature intelligently—of the various connections and distinctions of logical standpoints and so-called departments; and of all methods, moreover, of effecting this end, the historical can hardly be denied to be the easiest and most enlightening. Professor Creighton undertakes such a historical explanation with reference to Deduction, Induction and the 'New' logic; and his sketch is concise and bright—so far as it goes at all. Thus his account of the origin, development and respective functions historically of the Aristotelian and the inductive logics is animated, to the point, and for the most part very satisfactory. When, however, we come to that logic out of whose point of view his own treatment is to be determined, he merely *says* that it has arisen under the influence of Hegel, but how it has done so, and what Hegel's logic itself is like, or what are its antecedents back to Kant or, perchance, to Plato—all this is utterly passed over. Assuredly this failure of the author's, after he has devoted ten pages to the origins and evolution of a logic (the syllogistic) which he does *not* accept, at least as final, to provide some account of the historical beginnings and course of growth of that conception which he *does* accept as adequate, is to be set down as a defect not remedied even by the systematic exposition of this truer view which we

get in Part III. of our book. How very difficult it is to put simply, and yet in orderly truth, the history of that fruitful notion of thought and logic which Professor Creighton adopts, everyone must appreciate who has endeavored to teach it; but then, in the degree that this history is essential for our students, its difficulty, as already remarked, is just a writer's best opportunity, and his best justification for adding one more book to the many.

A more thorough preliminary working out of the development from the old to a new logic would have been not only helpful to the student, but of service to the author himself. For, in his desire to accord to the old logic that due recognition which consitutes one of his prime objects, he feels obliged, apparently, in the exposition of 'Syllogism,' which makes up Part I. of our book, to reproduce in the main also the old conventional, half-false order of topics—Terms, Propositions, Immediate Inference, Syllogism, Fallacies—and the old narrow, distorted theoretical descriptions, with a fuller truth of relationships pointed out only incidentally or forgotten altogether. In Chapter I. of this same part, some general precautions are, indeed, put forward; but the author himself does not live up to them; how much less will the thoughtless student! As an extreme illustration of failure of fidelity to the interests of the higher standpoint and a reversion, for the time-being, to olden easy-going, slipshod methods, may be cited the treatment of Terms. We are abruptly informed (p. 46)—"*wie aus der Pistole*"—that "the first divisions which we have to notice is that into Singular or Individual, General and Collective terms." These being defined in the familiar way, we are given the further divisions into abstract and concrete, positive and negative, absolute and relative; which distinctions, it should be said, particularly that of abstract and concrete, are handled very well from the point of view of the old-time 'art of logic.' What, though, of 'new' theory of thought is there in this (p. 52)?—"Positive (terms) express the existence * * *. A Negative term indicates the absence * * *. Words which are positive in form, are, however, often negative in meaning * * *." Or what in this (p. 55)?—"The nature of everything is largely [*sic*] determined by the nature of the things with which it stands in relation * * *. It is, however, possible to make a distinction between words which are the names of things comparatively [*sic*] independent and * * *." It is but in keeping to find this chapter *ending* with the subject of extension and intension of terms, *i. e.*, with that which ought to form the *beginning* of the treatment of such distinctions as individual and general, collective and material, etc. Now, to be sure, all this can be no result of a sheer ignorance of the spirit and demands of modern logic. Part III. sufficiently shows the contrary; and even in this same first Part we are given a chapter such as that on hypothetical and disjunctive arguments, one that is fertilized throughout by organic reflections, and, in consequence, is the freshest, most interesting and best of this entire section of the book. Or perhaps it would be juster to say that Professor Creighton knows quite generally how to be interesting, as also to be neat and concise, and, in most matters, pedagogically tactful. His only difficulty is an unresolved conflict of ideals—of the elementary practical interest of the old logic, with the theoretic one of exhibiting the doctrines of this logic under a wider scientific point of view. In this conflict, now the one end and now the other, is lost sight of; but herewith, of course, the author's great purpose of satisfying the requirements of both old and new logic goes just so far by the board.

The faults of Part I., however, are in sharp contrast with the merits of Part II. The latter is, by all odds, the best-done portion of the book. Here, too, perhaps, there might still be room for a completer working-out of systematic implications and relations; and there remains, after all the author's great deductions, too orthodox an assent to the 'Five Methods' of Mill; nevertheless, Professor Creighton here plants himself, everything considered, on modern ground, and in the attitude of live *thought*, with the result of giving us one of the very best introductory treatments of Induction that we possess. Aside from the difficulty of correlation that must arise for the student from his not having previously been given a genuine theory of thought deductively regarded, but only the mechanics of scholastic syllogistic—the

true relation of induction to deduction is both made clear in an introductory chapter and soundly adhered to afterwards. These are throughout described, not as two distinct things, but as distinguished phases of one and the same total activity of thought; deduction throwing an explicit emphasis upon the particularizing and synthetic aspect, while induction emphasizes the analytic and generalizing sides. The nature and distinction, likewise, of observation and explanation are very adequately set forth in the introductory chapter. Observation, the author earnestly enforces, is not a mere staring at facts: "To observe well it is necessary to be more or less definitely conscious of what one is looking for; etc., etc." Though he reserves the express assertion of the influence of hypothesis on even preliminary observation to a later chapter, it is implied throughout. Naturally, therefore, the difference, too, between observation and explanation is regarded not as absolute, but as largely a mere convenient one—of the final articulate bringing to bear of reason on experience, in contradistinction from an earlier half-groping stage of the same thing. So, likewise, of course, the goal of induction is conceived to lie, not in a mere empirical, passive gleaning of causal connections and generalities, but in the completion of that explanation we have just been speaking of—the active expansion of the living system of self-conscious human reason for and by the inclusion of the facts under investigation.

After the introductory chapter come three others on Methods of Observation—the first dealing with Enumeration and Statistics, the two others with the Determination of Causal Relations—under which head is given an exposition of the Methods of Mill. All this is well done, though, as already suggested, the simple acceptance of Mill's 'methods' as undisputed descriptions of the actual procedure of science is open to grave dissent. However, there is no failure to point out the drawbacks of the several methods separately; nor is the author in any sense guilty of treating them as being more than what at best they are—mere methods of *observing*, that is to say, methods not for the final solution of scientific problems, but, as Welton has aptly put it, methods merely for suggesting *hypotheses*. The two chapters on Methods of Explanation—the first on Analogy and the second on The Use of Hypotheses—as well as the concluding chapter on Fallacies of Inductive Reasoning, call for no comment. All are very good pieces of work.

Part III. deals with The Nature of Thought. Starting from the view of thought as an organism, and of knowledge as a passage not from the inward and known to the outside and unknown, but always from a previous partial knowledge to one of greater perfection, the author goes on to point out that thought and knowledge unfold or develop in accordance with the general laws of evolution; that this development is a progressive process both of differentiation and integration; that the different intellectual operations, as conception, judgment and inference, or induction and deduction, are not separate processes, but stages in one and the same activity; and that the nature of this activity is essentially discoverable in its simplest and most elementary form, the judgment; —for the concept is not the original element, out of which judgment is afterwards compounded, but is only the series of judgments that have already been made and that serve as the starting-point for new judgments. Judgment, accordingly, is the main theme of this present subdivision of our study.

The chief characteristics of judgment as the type of all thought and knowledge are: (1) its universality (claim of truth for everybody); (2) its necessity (not a mere psychological compulsion, but one arising from the dependence of judgment on *grounds*); (3) that it is always both synthetic and analytic; (4) that it is constructive of a *system* of knowledge. In this connection, however, require to be considered also the so-called 'Three Laws of Thought.' As very commonly put, these pretended supreme 'axioms' of judgment are altogether false. Rightly formulated, though, they are real laws of thought, in the sense of being implied in and descriptive of the thought-process as just set forth. (The topic of laws of thought in general, or of Categories, Professor Creighton does not enter upon.) The development of judgment, from a merely *felt* to a *conscious* necessity, gives rise to types of judgment. The succession of these is traced on broadly Hegelian lines, from quality

through quantity (enumeration and measure) and causal connection (stages in this latter conception being pointed out), to the completed form of individuality (which is that of unified system).

The chapter on The Nature of Inference requires no special comment, except that the solution offered of the old paradox: How can the mind pass from the known to the unknown? —to the effect that there is no such passage, there being "always a certain amount of identity between the two ends of the process" [p. 326] —is hardly searching. Should not questions of this sort, if taken hold of at all, be handled with a certain thoroughness, even where it is inexpert novices that one has to reckon for? The concluding chapter, likewise, on Rational and Empirical Theories, calls for no discussion, its spirit beining manifest from what has been already related, and its upshot, in the rejection of either attitude in abstraction, sound, notwithstanding that the rationalism described is rather that of Descartes than the profounder doctrine of Kant.

Of this Part as a whole, this much only need be said. So far as it really proceeds, it is excellent and, doubtless, gives the entire book a value immeasurably beyond that of the dry, shallow, old-fashioned manual. And yet a questioning does arise, just how far the practically total avoidance of direct issue with the more fundamental difficulties concerning thought—the refusal to dip even lightly into the deeper waters of philosophy—is an advantage even for beginners, beginners of the sort who are ready to read such a book as this at all? For may it not be doubted if a bright student can fail—and is it not to be hoped that he shall not fail —to be perplexed by a groping perception of problems, a mere definite pointing out of which, or a mere hint towards whose solution, would have been of the greatest help to him, but which here are quite ignored? Surely our fear should be, not of bringing our pupils, when need is, into the labyrinths of metaphysic, but of ourselves not proving clear-sighted guides therein. However, in this point it may be that our judgments must turn on individual notions of how completely logic can and ought to be cut off from metaphysics.

Evidently in this work Professor Creighton has not given us the 'definitive' text-book—if there be any sense in the shallow favorite phrase. His book does not closely approximate its design. What he has produced is this, a book with a good many good things in it. These require a stricter organization; in parts, some supplementation; in other parts (perhaps), a pushing deeper back into philosophy; and, in one section, a considerable correcting. Yet with all these drawbacks—granted a teacher capable of coping with them—Professor Creighton's book is not unsuited, as an introduction, to become a very useful one; rather it undoubtedly *is*, as pointing in a wholly desirable direction, one of the very best on the market.

GEORGE REBEC.

SCIENTIFIC JOURNALS AND ARTICLES.

THE *Journal of Geology*, February–March, 1899. The first paper is by Henry S. Washington, and is the third installment of the series relating to 'The Petrographical Province of Essex County, Mass.,' pp. 105–122. Dr. Washington treats of the rocks occurring in dikes, viz: Aplite, quartz-syenite-porphyry, paisanite, sölvsbergite and tinguaite. The series is to be continued. B. Shimek, 'The Distribution of Loess Fossils,' pp. 122–141. The author emphasizes certain important points in the character and distribution of the fossil shells found in the loess, basing his conclusions on facts observed in connection with existing land shells. His observations confirm the Æolian origin of the Western loess. H. W. Turner, 'Granitic Rocks of the Sierra Nevada,' pp. 141–163. This is an important addition to our knowledge of the general petrography of the granitoid rocks of the Sierras. Types embracing true granites, grano-diorites, quartz-monzonites, soda-aplites, quartz-diorite-aplites and pegmatites we described with many analysis. Under the studies for students the development and geological relations of the mammalia are outlined by E. C. Case. Editorials and a valuable summary of 'Current Pre-Cambian Literature,' by C. K. Leith, close the number. The latter contributions are particularly to be commended,

as they afford excellent summaries and temperate and judicial comments.

We are glad to note that owing to its increasing circulation the publishers of *Science Abstracts* (Spon & Chamberlain, New York) have been able to make a reduction in the price. The journal, issued monthly under the direction of the Institution of Electrical Engineers and the Physical Society of London, is performing a very important service for the advancement of science. The first volume contained 1,423 abstracts and thus gives a full survey of the progress of physics and electrical engineering. The advantages both pure and applied science gain by cooperation in the pubcation of this journal are evident on almost every page.

SOCIETIES AND ACADEMIES.

In response to a circular sent out to physicists by a committee representing seven institutions, a meeting was held on Saturday, May 20th, at 10:30 a. m., at Columbia University, New York, for the purpose of organizing a Physical Society. Thirty-eight persons were present, representing seventeen institutions, as follows: Wesleyan University, 2; New York, 2; Yale, 3; Cornell, 5; Columbia, 7; Pennsylvania, 2; Bryn Mawr, 2; Vassar, 2; Princeton, 2; Amherst, 1; Mt. Holyoke, 2; Smith, 1; Harvard, 2; Vermont, 1; Swarthmore, 2; Clark, 1; U. S. Weather Bureau, 1. Letters had been received by the committee from many physicists in all parts of the country, expressing approval of the organization and a willingness to join.

Professor Pupin welcomed the physicists present on behalf of Columbia University, and introduced Professor Cooley, of Vassar, the senior member present, as Chairman of the meeting. Professor Webster was elected Secretary, and addressed the meeting in explanation of the purpose of the call. Reports of communications received by members of the committee were made by the Secretary and by Professors Magie, Nichols and Pupin. On motion of Professor Rosa, it was voted that a Physical Society be organized. On motion of Professor Magie, it was voted that a committee be appointed to draft a constitution for the Society. On motion of Professor Magie, it was voted that the meetings be held in New York, except in special cases. An amendment offered by Professor Nichols was adopted, to the effect that the meeting express the willingness of the Society to establish local sub-sections meeting in other cities when a demand shall arise. After a rather lengthy discussion, an amendment proposed by Professor Pupin was adopted, to the effect that the meeting express the sentiment of the Society to cultivate the closest relations with Section B of the American Association for the Advancement of Science, and to contribute by everything in its power to the success of the Association. Upon motion of Professor Magie, it was voted that a bulletin be published by the Society. Professors Webster, Nichols, Magie, Peirce, Hallock and Pupin were elected as the committee to draft a constitution. The meeting adjourned at 12:30 and partook of lunch kindly provided by representatives of Columbia University.

The session was resumed at 2:20 p. m., and the constitution submitted by the committee was adopted. All the above notes were therein embodied. A list of nominations for officers was reported by the same committee, and the following were unanimously elected: President, Professor H. A. Rowland, of Johns Hopkins; Vice-President, Professor A. A. Michelson, of Chicago; Secretary, Professor Ernest Merritt, of Cornell; Treasurer, Professor Wm. Hallock, of Columbia. Nominations were then made from the floor for members of the Council who, with the officers, are to have the general management of the Society, and the following were elected: Professors A. G. Webster, of Clark; J. S. Ames, of Johns Hopkins; H. S. Carhart, of Michigan; B. O. Peirce, of Harvard; W. F. Magie, of Princeton; E. L. Nichols, of Cornell; M. I. Pupin, of Columbia.

It was voted that the election of new members be made by the Council; that the annual fee be five dollars; that there be no initiation fee, and that four meetings be held annually.

The constitution provides that the name of the Society shall be the American Physical Society, and that its object shall be the advancement and diffusion of the knowledge of physics. A circular will soon be issued containing the text of the complete constitution, which will be

sent to physicists generally, and provision will be made that those voting upon it by mail shall be received as original members of the Society. The first regular meeting will be held in October. Already about a hundred members are assured, and it is hoped that the Society may eventually contain all leading American physicists and take a prominent place among our scientific societies.

A. G. WEBSTER,
Secretary pro tem.

THE BIOLOGICAL SOCIETY OF WASHINGTON.

THE 304th regular meeting was held March 11th. The program consisted of an illustrated lecture on the general physiographical and biological features of Puerto Rico by Dr. R. T. Hill, of the U. S. Geological Survey. The mountain and drainage systems were explained and classified, and the relations of the various geological formations and the resulting soils to the flora and agricultural resources of the island were pointed out.

The lecture was supplemented by informal accounts from Dr. B. W. Evermann, of the U. S. Fish Commission, and Mr. A. B. Baker, of the Zoological Park, who had recently returned from Puĕrto Rico. Dr. Evermann stated that the coasts are almost everywhere abrupt and rocky, and that the water is generally agitated by a powerful surf. The result of these conditions is that only those types could survive which were adapted for life in deep water or which were fitted by habits and structure to secure protection among the rocks. This applies not only to the fishes, but to the molluscs, crustacea, algæ and other groups, all classes of aquatic organisms having received the attention of the expedition. The fresh-water fish fauna is not extensive and has been derived independently from marine groups, having no connection with the fresh-water forms of the continent. Dr. Evermann also explained the methods of the native fisherman and exhibited examples of traps and decoys for fishes and turtles.

Mr. Baker noticed some additional points regarding the geography and physiography of the island and the almost complete destruction of the forests, which has had a disastrous effect upon the fauna, having more less completely exterminated some species and caused profound changes in the habits of others.

At the 305th regular meeting, March 25th, Dr. T. S. Palmer traced the history of the introduction of the English sparrow into the United States and its subsequent gradual distribution throughout temperate North America.

The case of the mongoose in Jamaica, Puerto Rico and Hawaii was also considered, together with accounts of other accidental or intentional importations of mammals or birds, and the general conclusion was drawn that once removed from the natural conditions and checks of its original habitat it is impossible to know in advance of the experiment what the utility or injury of any given species will be, and hence such experiments should be undertaken with the greatest caution. The speaker considered the introduction of game birds attended with less danger on account of the fact that they would more easily be kept under control by human agency.

Mr. M. B. Waite exhibited specimens illustrating 'The Effects of the Recent Severe Cold on Vegetation,' and described the processes attending the freezing of plant cells, explaining that sudden thawing caused death in many instances because the protoplasm of the cells was unable to reabsorb the water lost in freezing.

The extent of recent injuries to fruit trees and ornamental and native plants was then touched upon and subsequently discussed by several members.

Mr. F. A. Lucas then read a paper on the 'Mental Traits of the Fur Seal,' saying that it had a practical bearing on the question as to whether or not the fur seal was likely to change its habits owing to the presence of man on the islands where it bred. The behavior of the seals on the drives and killing grounds was described as showing the low grade of the animal's intellect and its inability to think for itself. The female seals were said to take little interest in their offspring and to show no affection, while the sight and smell of blood seemed to produce no effect on the animals. The conclusion reached was that the fur seal is a creature of instinct and not guided to any extent by reason; that its habits, having been formed by

the slow process of natural selection, were not likely to be changed. The general impression that the seal is a very intelligent animal was thought to be partly explainable by the fact that its non migratory relatives, such as the sea lion and the hair seal, are in reality much more adaptable, not being possessed of the powerful and unvarying instincts of the fur seal.

O. F. Cook,
Secretary.

GEOLOGICAL CONFERENCE AND STUDENTS' CLUB OF HARVARD UNIVERSITY.

Students' Geological Club, February 14, 1899. Mr. A. W. G. Wilson gave a 'Demonstration of Mineral Determination by Volatile Iodide Coatings.' After presenting a brief *résumé* of Dr. Haanel's paper 'On the Application of Hydriodic Acid as a Blowpipe Reagent,' he demonstrated the use of plaster of paris tablets as supports, and of hydriodic acid as a reagent for the determination of a number of the common and some of the rarer elements.

Geological Conference, February 21, 1899. Mr. J. E. Woodman spoke on 'Notes on the Glacial Geology of Nova Scotia.' The Province is divided into two parts by fairly sharp boundaries. In the south is the lake region, characterized by till, without distinct form, or in the form of moraines and occasional drumlins, and a little stratified drift. In the north, lakes are largely absent, and there is a considerable amount of stratified drift, with few morainal deposits. In the center, near the northern edge of the lake region, drumlins of a very elongate form are abundant.

Throughout the country the direction of ice-movement was controlled by pre-Pleistocene topography to an extent seldom seen in New England. Thus, in Cornwallis and Annapolis valleys the ice followed the same lines as present drainage; in the center of the Province it ran southward, and along the north shore east of Pictou it ran eastward. The short distance of carriage of much of the drift is noticeable. Changes in the character of the drift follow quite closely those of the larger features of bed-rock geology.

The center and eastern part of the Province shows little stratified drift. The northwestern portion shows a considerable amount, chiefly in the form of eskers and kame-terraces. Many fine eskers can be followed on the road from Yarmouth to Windsor, but east of there few occur. The absence of coarse material in the central part of the peninsula is very noticeable. Few surface boulders are seen along the railroad line after leaving the lake and morainic country at Windsor Junction, until well on toward the Strait of Canso, where a few morainic accumulations were noted. All along the north coast the drumlins are indistinct in outline, being, with very few exceptions, mere drumlinoid hills. In the Strait, ice-motion changed from east to south along the now sunken valley.

In Cape Breton the obedience of ice-motion to topography is still more marked. The mass appears to have moved, in the interior, from the low region of the Bras d'Or lakes northward along the valleys of rivers which now flow south. This motion did not continue far, and the higher parts of the islands are all unglaciated. On the west and northwest coast the ice affected only the bordering Carboniferous lowland, penetrated a very short distance up the wider valleys, and left the central peneplain, on granite and schist, untouched.

J. M. Boutwell,
Recording Secretary.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

At the meeting of the Academy of Science of St. Louis, on the evening of May 15, 1899, thirty persons present, the Secretary presented, by title, a paper by Professor F. E. Nipher, on 'Temperatures of Gaseous Nebulæ.'

Professor E. M. Shepard exhibited an interesting series of lantern slides and ethnological specimens procured by him during a recent extended trip through the islands of the South Pacific, especially New Zealand, Fiji and Samoa, illustrating the natural history and ethnology of those islands.

Two persons were proposed for active membership in the Academy.

William Trelease,
Recording Secretary.

DISCUSSION AND CORRESPONDENCE.

THE TELEPATHIC QUESTION.

TO THE EDITOR OF SCIENCE: When a scientific discussion degenerates into protest and imputation of motive it is probably time for the discusion to stop. But I wish to state, in self-defence, that I do not 'seek to leave upon the reader's mind' the two impressions to which Professor James refers. I do not say that Lehmann first considered whispering; I say that he was the first *thoroughly to investigate* it. There is a difference. I do not imply that Lehmann introduced number-habits; I say that the next step in advance beyond him is an exhaustive study of number habits. Again, there is a difference.

E. B. TITCHENER.

CURRENT NOTES ON METEOROLOGY.

CLIMATIC CHANGES ON THE PACIFIC COAST.

IN the *National Geographic Magazine* for May the question of climatic changes on the Pacific coast is discussed by J. B. Leiberg, under the title: '*Is Climatic Aridity impending on the Pacific Slope? The Testimony of the Forest.*' The most important results of the study are as follows: The arid, non-forested plains of eastern Oregon yield silicified remains of arborescent vegetation nearly or quite identical with existing species on adjacent areas, thus proving the presence of forest growth on these timberless lands at no very remote period. On the semi-arid tracts the forest, although consisting of species capable of enduring dry climatic conditions, show everywhere a persistent and gradual dwindling in extent and density. In the subhumid forest there is a slow and apparently ineffectual adaptative evolution of smaller forms of the various species to replace the larger ones which require more moisture for their growth. In the humid forest the same phenomena are found. So far as the evidence derived from a study of the forest conditions is concerned, there seems to be a fairly well defined change of climate in progress on our Pacific coast, from a more humid to a less humid.

In the same number of the *National Geographic Magazine*, Ganett, in a paper entitled '*The Redwood Forest of the Pacific Coast*,' states that "everything appears to indicate that for some reason, probably a progressive drying of the climate, the present environment is not favorable to the growth of redwood, and that with the clearing away of the present forests the end of the species as a source of lumber will be at hand."

WAVE CLOUDS.

THE formation of waves between different strata of the atmosphere was carefully studied and described by von Helmholtz. These waves become visible only when clouds are formed in them at those points where condensation takes place, but undoubtedly invisible waves occur very commonly in our atmosphere. The appearance of clouds in parallel lines across the sky is an indication of the presence of atmospheric waves. In the Februry number of the *Monthly Weather Review*, A. J. Henry, of the U. S. Weather Bureau at Washington, presents five excellent views, reproduced from photographs, of alto-cumulus cloud rolls, observed at on November 23, 1898, and on January 27, 1899. The views of November 23d are especially interesting as showing the gradual dissolution of the clouds.

METEOROLOGICAL WORK IN ALASKA.

THE Central Station of the Alaskan Section of the Climate and Crop Service of the Weather Bureau has been transferred from Sitka to Eagle, on the Yukon, near the British line. The Chief of the Weather Bureau hopes, by this change, to facilitate the establishment of meteorological stations in the region of the upper Yukon, where, owing to poor facilities for communication, it was found impossible to establish such stations when the headquarters of the Service were at Sitka.

RECENT PUBLICATIONS.

Measurement of Precipitation. C. F. MARVIN, U. S. Department of Agriculture, Weather Bureau. Circular E, Instrument Division. 8vo. Washington, D. C., 1899. Pp. 28.

A pamphlet of instruction for the measurement and registration of precipitation by means of the standard instruments of the Weather Bureau.

Ninth Annual Report of the Board of Directors of the New Jersey Weather Service, 1898. E. W.

McGann. 8vo. Trenton, N. J., 1899. Pp. 205.

This Report contains a relief map of New Jersey, prepared by the Geological Survey of the State, with the note: "The influence of the diversified topography of New Jersey upon its climate is apparent by comparing this relief map with the temperature and rainfall charts which follow." This plan of publishing topographic maps of the different States in the Annual Reports of the Weather Services is an excellent one, and should be generally adopted.

Rivers of Oregon, Washington, Idaho and Western Montana. B. S. Pague. River Bulletin No. I., 1899, U. S. Department of Agriculture, Weather Bureau. Portland Ore., 1899.

This valuable Bulletin, the first of its series, concerns the precipitation over the Pacific Northwest and the possibility of high water from the melting snow in the mountains. It contains a general forecast of the probable height of the Columbia River in May and June, as dependent upon the temperature conditions and the resulting more or less rapid melting of the snow on the mountains.

Monthly Rainfall Chart for Fifty Years at San Francisco. Compiled by Herman Schussler, C. E. Published by the Central Pacific Railroad Company.

A graphic representation of the monthly rainfalls for each year during the past fifty years.

R. DeC. Ward.

Harvard University.

A BRYOLOGICAL MEMORIAL MEETING.

Columbus was the home for many years of William S. Sullivant and Leo Lesquereux, two names which will awaken love and reverence from all students of North American mosses and hepatics. It is twenty-six years since Sullivant died, and this last quarter of a century has seen a marked extension of the limits of bryological study and a large increase in the number of students. It seems a fitting time and place to take a survey of the field, review the past and make plans for the future. Hence it is proposed to make the coming meeting of the American Association for the Advancement of Science, which is to be held at Columbus, the occasion for a Memorial Day in honor of the Nestors of American Bryology and to call on all botanists and scientific magazines to help to make the occasion a memorable success. It is proposed to present a series of papers, illustrated by photographs, specimens and microscopical slides, books and pamphlets under the following topics:

Historical papers and collections showing the bryological work of Hedwig, Palisot de Beauvois, Michaux, Muhlenberg, Bridel, Torrey, Drummond, Hooker and Wilson, Greville, Sullivant and Lesquereux, James and Watson, Austin, Ravenel, Wolle, Eaton, Faxon and Müller; supplementing these there will be shown collections of specimens, macroscopic and microscopic, illustrating the monographic work of recent American students.

If foreign students who have worked on North America bryophytes can be persuaded to cooperate with us the following will be asked to contribute: Bescherelle, Brotherus, Cardot, Dixon, Kindberg, Mitten, Pearson, Roll, Stephani and Warnstorf.

An effort will be made to secure the loan of type specimens and illustrations from the following sources: The Academy of Natural Sciences of Philadelphia, Academy of Sciences of New York, Columbia University, The National Museum, The Ohio State University, The University of Wisconsin and Yale University, as well as from private collections. It is also intended to exhibit any portraits, autograph letters and type specimens and drawings of special interest, which may be loaned for the occasion, as well as presentation copies of books and pamphlets.

The following committee of organization will gladly answer questions and give assistance to those who wish to contribute: Professor Charles R. Barnes, University of Chicago; Mrs. N. L. Britton, New York Botanical Gardens; Professor W. A. Kellerman, Ohio State University; Dr. George G. Kennedy, Readville, Mass.; Professor L. M. Underwood, Columbia University.

SCIENTIFIC NOTES AND NEWS.

The Royal Institution of Great Britain, in commemoration of its centenary, has elected a number of honorary members, including Professors S. P. Langley, Carl Barus, A. A. Michel-

son, R. H. Thurston, J. S. Ames and George F. Barker, and President W. L. Wilson.

THE American delegates to the Congress of Tuberculosis now meeting at Berlin are Dr. Boyd, of the Navy; Dr. Vaughan, of the Marine Hospital Service; Dr. De Schweinitz, of Department of Agriculture; Dr Stiles, scientific attaché to the embassy at Berlin.

MR. FRANK A. FLOWER, Chief Statistician of the State of Wisconsin, has been appointed Chief of the Agricultural Division of the Census.

OXFORD University has conferred the honorary degree of M.A. upon Mr. Roland Trimen, F.R.S., formerly Curator of the South African Museum, Cape Town, and late President of the Entomological Society of London.

LORD JAMES, of Hereford, has been elected chairman of the governing body of the Imperial Institute, London, in the room of the late Lord Herschel.

PROFESSOR GEORGE F. BARKER, of the University of Pennsylvania, and Professor Carl Barus, of Brown University, are among the American delegates attending the Jubilee of Sir George Stokes, of Cambridge.

PRESIDENT WILLIAM L. WILSON, of Washington and Lee University, has been chosen by the Regents of the Smithsonian Institution to represent them at the approaching celebration of the centennial of the Royal Institution of Great Britain.

THE St. Petersburg Geographical Society has awarded its great gold medal to Dr. G. Radde, Director of the Caucasian Museum at Tiflis.

MAJOR ROSS, who has recently been appointed lecturer at the newly established school of tropical diseases at University College, Liverpool, has given a lecture before the Biological Society of that city on the relations of the malarial parasite to the mosquito, to which his own researches have been such an important contribution.

THE death is announced of Sir Frederick McCoy, F.R.S., professor of natural sciences at Melbourne University. We learn from the London *Times* that he was born in Dublin in 1823 and that he was educated for the medical profession at Dublin and Cambridge Universities, but early devoted himself to natural science. Sir R. Griffith invited him to make the paleontological investigations for the Geological map of Ireland for the boundary survey, the results of which he published in 1844. Afterwards he joined the Imperial Geological Survey of Ireland, and Sir R. Peel's government appointed him professor of geology in the Queen's University in 1850. Professor McCoy undertook, in conjunction with Professor Sedgwick, a large work on paleozoic rocks and fossils based on the Woodwardian collection at Cambridge. In 1854 he was appointed the first professor of natural science in Melbourne University, and held the chair till his death. His services to Victoria were considerable, notably in regard to the Geological Survey of the colony, as a member of various commissions, and as the founder of the Melbourne National Museum. In 1880 he was elected F.R.S., and was one of the first to receive the honorary degree D.Sc. from Cambridge. In 1886 he was made a C.M.G., and in 1891 he was promoted to be K.C.M.G. Sir F. McCoy also received the Order of the Crown of Italy from King Victor Emanuel, the Emperor of Austria's great gold medal for arts and sciences, the Murchison medal of the Geological Society of London, and many similar distinctions.

DR. LUDWIG STRÜMPELL, professor of philosophy and pedagogy at Leipzig, has died at the age of 87 years. He was an eminent representative of the Herbartian School.

MR. H. B. HEWETSON, an eminent English oculist, has died at the age of 49 years. He was the author of numerous scientific contributions, being a member of the Zoological, Linnæan and Geographical Societies and a member of the Ornithologists' Union.

DR. THEODOR VON HESSLING, formerly professor of anatomy in the University of Munich, has died at the age of 83 years.

THE Rev. T. Neville Hutchinson, died on May 6th at the age of 73 years. Mr. Hutchinson was science master at Rugby from 1866–83 and did much to introduce the study of science in the English public schools.

THE Secretaries of the Sections of the American Association for the Advancement of Science are sending to members notices of the Colum-

bus meeting, which opens on August 21st. It is hoped that good programs may be arranged for the various sections at an early date.

THROUGH elections at the annual meeting on May 19th, and designations at the ensuing meeting of the Board of Managers, the organization of the National Geographic Society for the ensuing year was made as follows: President, Alexander Graham Bell; Vice-President, W J McGee; Treasurer, Henry Gannett; Recording Secretary, F. H. Newell; Corresponding Secretary, Willis L. Moore; Foreign Secretary, Eliza Ruhamah Scidmore; additional members of the Board, Marcus Baker, Charles J. Bell, Henry F. Blount, F. V. Coville, G. K. Gilbert, General A. W. Greely, Assistant Secretary David J. Hill, John Hyde, S. H. Kauffmann, Director C. Hart Merriam, Superintendent W. B. Powell, Superintendent Henry S. Pritchett and J. Stanley-Brown.

THE 12th International Congress of Orientalists will meet at Rome on October 12, 1899. Cards of membership ($4.00) may be obtained from Mr. Cyrus Adler, Smithsonian Institution, Washington, D. C.

THE New York State Civil Service Commission announces that examinations will be held on June 9th and 10th, which will include the position of assistant in zoology in the State Museum, with a salary of $900; the positions of sanitary, electrical and heating experts in the office of the State Architect, with salaries from $1,200 to $1,500; and the position of bridge designer and inspector in the State Engineer's Office, with a salary of from $1,800 to $2,400. The examination for an assistant in dietary experiments has been postponed to June 10th.

DR. DANIEL G. BRINTON, professor of American archæology and linguistics at the University of Pennsylvania, has presented to the University his collection of books and manuscripts relating to the aboriginal languages of North and South America. The collection represents a work of accumulation of twenty-five years, and embraces about 2,000 volumes, in addition to nearly 200 volumes of bound and indexed pamphlets bearing on the ethnology of the American Indians. Many of the manuscripts are unique. A number of the printed volumes are rare or unique and of considerable bibliographical importance. The collection of works on the hieroglyphic writings of the natives of this country embraces nearly every publication on the subject. The special feature of the library is that it covers the whole American field, North, Central and South, and was formed for the special purpose of comparative study.

THE collection of shells of the late Mr. Henry D. Van Nostrand, recently given to Columbia University, is well known among malacologists as one of the most valuable of private collections in the country; it contains the larger and better portion of the land shells of the West Indies collected by Thomas Bland, including many types, together with many of the rarest specimens of the Perry Expedition.

THE Technical Education Board of the London County Council is cooperating with the Asylums Committee in offering a scholarship of £150 a year, tenable for two years, for students of either sex (preferably qualified practitioners), to enable them to carry on investigations into the preventible causes of insanity. The scholar will carry on investigations in the pathological laboratory attached to Claybury Asylum.

PROFESSOR A. G. NATHORST, of the Imperial Museum of Natural History of Stockholm, with several scientific companions, sailed from Helsingfors on May 25th to search along the northeast coast of Greenland for Andrée. Professor Nathorst hopes to meet the *Fram* with Captain Otto Sverdrup.

MR. A. C. HARRISON, JR., Mr. W. H. Furness and Dr. H. M. Hiller, who recently returned from an exploration of Borneo, with collections for the University of Pennsylvania, are about to start on another expedition. They expect to make explorations in the northern part of Burmah and make archæological and ethnological collections.

WE announced last week the laying of the foundation stone of the new building which is to complete the South Kensington Museum, hereafter to be officially known as the Victoria and Albert Museum. This building will contain the art and industrial collections, while new buildings for the Royal College of Science

will be begun at once. The sum of £300,000 has been appropriated for these buildings, which will occupy a position directly facing the Imperial Institute.

THE new building erected in the Dublin Zoological Gardens in memory of the late Professor Samuel Haughton was formally opened on May 19th by the Lord-Lieutenant, in the presence of a large gathering. Field-Marshal Lord Roberts, President of the Royal Zoological Society, described the purpose of the meeting and said that the new building was intended as a tribute to the memory of Dr. Haughton, whose name was intimately connected with many of the leading institutions in Dublin, but with none more closely than with the Royal Zoological Society, of which he had been five years President and 21 years Honorary Secretary.

THE City of Philadelphia has appointed a committee of expert engineers consisting of Rudolph Hering, of New York, Samuel Gray, of Providence, R. I., and Joseph L. Wilson, of Philadelphia, to make an investigation of the water supply of Philadelphia.

AN institute for the study of tropical medicine will be established at Berlin, with Dr. Koch as Director.

THE *Electrical World* abstracts from English journals an account of the early work of Professor Huges (inventor of the microphone), in wireless telegraphy by means of etheric waves; it appears to be the first published account of his experiments, which were made in 1879. He was experimenting with his microphone and induction balance, and found that the microphone produced a sound in the receiver even when it was placed several feet distant from the coils through which an intermittent current was passing and not in any other way connected. He found that the whole atmosphere, even in several rooms distant from there, would be invisibly changed and that this could be noticed with a microphone and telephone receiver. He experimented on the best form of receiver for these invisible electric rays, which he found would pass over great distances through walls, etc. He found that carbon contacts or a piece of coke resting on bright steel were very sensitive and self restoring receivers. A loose contact between metals, while equally sensitive, required restoring. He also used the microphone as a relay in detecting such rays. He endeavored to discover the best receiver so as to utilize such waves for the transmission of messages. He showed his experiments to a number of well-known physicists at that time. The distance was 60 feet in the building, but he also took the instrument on the street, and walked away from the transmitter, obtaining signals up to 500 yards. He claimed the existence of the waves at that time, but was unable to convince others of their presence. He also calls attention to still earlier experiments of Professor Henry, of Princeton (U. S.), which were published by the Smithsonian Institution, Vol. I., p. 203, the date being probably about 1850; he magnetized a needle in a coil 30 feet distant; also by a discharge of lightning eight miles distant.

UNIVERSITY AND EDUCATIONAL NEWS.

THE election of Professor Arthur T. Hadley to the presidency of Yale University by the Corporation on May 25th marks the beginning of a new era in the development of a great university. Yale has adhered more closely than most of our larger institutions to the clerical and classical traditions of the American college, and President Hadley, while conserving what is good, will undoubtedly use his influence to make Yale, as a university, the equal of Harvard. Like the Presidents of Harvard, Johns Hopkins and Stanford Universities, President Hadley may be claimed as a man of science, his work on railway transportation and other subjects being strictly scientific in character.

CLARK University proposes to celebrate its decennial by special exercises beginning on July 5th. These will include lectures by eminent foreign men of science. Invitations to speak having been accepted by M. Émile Picard, professor of mathematics at the University of Paris and a member of the Institute; Dr. Angelo Mosso, professor of physiology at the University of Turin; and Dr. Santiago Ramon y Cajal, professor of histology and pathological anatomy at the University in Madrid.

A SPECIAL course in the fundamental problems of geology intended particularly for college

teachers will be offered during the first term of the summer quarter (July 1 to August 10, 1899) at the University of Chicago by Professor T. C. Chamberlin. This will embrace a discussion of the chief problems of geology involving basal principles and fundamental modes of interpretation. While old views will not ignored, a special feature of the course will be a relatively new series of working hypotheses based upon the accretion theory of the earth's origin. These hypotheses will be carried out to their practical applications in the unsolved problems of geology and be made the basis of new modes of interpretation of geological history. The course will embrace an exposition of the stages of expansional, restrictional and provincial life evolution in the earth's history and the conditions controlling them. The functions of base-levels, sea-shelves, epicontinental seas, and continental stages of quiescence and readjustment in the control of life evolution, will be set forth. Parallel with the above there will be given a course in glacial geology involving a discussion of principles, the phenomena and modes of interpretation. These courses will be offered for the coming summer only, in response to an expressed desire for them. The usual courses in general geology and physiology, and in field and laboratory work, will be given by Professor Salisbury, aided by Messrs. Goode, Atwood, Calhoun and Finch.

THE Rhode Island College of Agriculture and Mechanic Arts, with the cooperation of Hon. Thomas B. Stockwell, State Commissioner of Public Schools, and Dr. Horace S. Tarbell, Superintendent of Schools in Providence, proposes to open a summer school for nature study at Kingston, R. I., from July 5 to 19, 1899, provided forty applicants are enrolled before June 1st. A general summer school is not contemplated, and the work offered by the various departments constitutes a single course dealing solely with local phenomena in their adaptability to the teaching of nature study. The distinctive feature will be the study of living nature. On the excursions attention will be directed to special facts and illustrations in botany, zoology, geography and mineralogy, and to the manner in which chemical, physical and biological laws are utilized by practical application to horticulture and agriculture. The evenings will be devoted to general lectures bearing upon nature and upon methods of teaching nature study. Among those who have consented to aid by conducting excursions, conferences and lectures are Professors H. C. Bumpus, E. G. Conklin, H. W. Conn, C. B. Davenport and W. M. Wheeler.

THE Women's Medical College of New York will be closed at the end of the year, when the thirty-first annual commencement will be celebrated. When the College was established there was no opportunity for women to secure a medical education, but Johns Hopkins and Cornell having admitted women to their medical schools it has been decided that a special medical school for women is unnecessary. The infirmary for women and children will be continued, and the buildings of the College will be used for graduate work.

THE medical faculty of the University of Pennsylvania has made nominations as follows: Dr. James Tyson, professor of clinical medicine, to the chair of medicine, vacant by the death of the late Dr. Pepper; Dr. John H. Musser and Dr. Alfred Stangel, to be professors of clinical medicine; Dr. Judson Daland, Dr. M. Howard Fussell, Dr. John K. Mitchell and Dr. Frederick A. Packard to be assistant professors of medicine, and Dr. G. Davis to be assistant professor of applied anatomy.

DR. C. E. BEECHER, professor of historical geology in Yale University, has been appointed to succeed the late Professor O. C. Marsh as Curator of the Geological Collections of the Peabody Museum. Professor Beecher has been made a member of the Executive Council of the Museum.

AT the University of Kansas the following appointments have been recently made: W. R. Crane, of Janesville, Wis., to be assistant professor of mining engineering; Thomas M. Gardner, of Mitchell, Ind., to be assistant professor of mechanical drawing; Dr. Ida Hyde, of Cambridge, Mass., to be assistant professor of zoology; Hamilton P. Cady, of Ithaca, N. Y., to be assistant professor of chemistry, and Charles L. Searcy, of the College of Montana, to be assistant professor of civil engineering.